

Beryllium

CAS No. 7440-41-7

General Information

Pure beryllium is a hard, gray metal. In nature, beryllium can be found in mineral rocks, coal, soil, and volcanic dust. Beryllium compounds are commercially mined, and the beryllium is purified for use in mirrors and in special metal alloys in the nuclear, electrical, aircraft, and machine-parts industries. Small amounts of beryllium dust can enter air from burning coal and oil. Exposure to beryllium occurs mostly in the workplace, near some hazardous waste sites, and from breathing tobacco smoke.

In the workplace, beryllium dust enters the body primarily through the lung, where it remains for years, but there are little data available on how the metal accumulates in the lung. Berylliosis, a granulomatous interstitial lung disease that results from chronic beryllium inhalation, is rarely seen today. Skin contact with beryllium may also produce dermatitis, and some people demonstrate a hypersensitivity reaction to beryllium. Workplace air standards for external exposure have been established (OSHA, ACGIH). Beryllium is an animal carcinogen, and it is reasonably anticipated to be a human lung carcinogen (IARC). NTP considers beryllium to be a known carcinogen. Information about external exposure (environmental levels) and health effects is available from the EPA IRIS Web site at <http://www.epa.gov/iris>

Table 19. Beryllium

Geometric mean and selected percentiles of urine concentrations (in µg/L) for the U.S. population aged 6 years and older, National Health and Nutrition Examination Survey, 1999-2000.

	Geometric mean (95% conf. interval)	Selected percentiles (95% confidence interval)						Sample size
		10th	25th	50th	75th	90th	95th	
Total, age 6 and older	*	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD	2465
Age group								
6-11 years	*	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD	340
12-19 years	*	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD	719
20 years and older	*	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD	1406
Gender								
Males	*	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD	1227
Females	*	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD	1238
Race/ethnicity								
Mexican Americans	*	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD	884
Non-Hispanic blacks	*	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD	568
Non-Hispanic whites	*	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD	822

< LOD means less than the limit of detection, which is 0.09 µg/L.

* Not calculated. Proportion of results below the limit of detection was too high to provide a valid result.

and from ATSDR at
<http://www.atsdr.cdc.gov/toxprofiles>.

Interpreting Urine Beryllium Results Reported in the Tables

Urine beryllium levels were measured in a subsample of NHANES participants aged 6 years old and older. Subsamples were randomly selected within the specified age range to be a representative sample of the U.S. population. Previous studies reporting urinary levels for normal populations either have reported undetectable concentrations or have not had comparable detection limits (White et al., 1998; Komaromy-Hiller et al., 2000; Minoia et al., 1990; Paschal et al., 1998). A summary of

reference ranges taken from previous studies suggested that a true reference range for urinary beryllium is below many current detection limits ($< 1 \mu\text{g/L}$) (Hamilton et al., 1994). Apostoli and Schaller (2001) suggest that previous detection limits are inadequate to quantitate normal human exposure. In that study, urinary beryllium in workers correlated with air-exposure measures. When air levels were below the recommended threshold limit value, urinary beryllium concentrations ranged from 0.12 to 0.15 $\mu\text{g/L}$. Because the detection limit documented in this *Report* was 0.09 $\mu\text{g/L}$ and because 99.8% of values were undetectable, these NHANES 1999-2000 levels are likely to be lower than levels considered safe for workers.

Table 20. Beryllium (creatinine adjusted)

Geometric mean and selected percentiles of urine concentrations (in $\mu\text{g/gram}$ of creatinine) for the U.S. population aged 6 years and older, National Health and Nutrition Examination Survey, 1999-2000.

	Geometric mean (95% conf. interval)	Selected percentiles (95% confidence interval)						Sample size
		10th	25th	50th	75th	90th	95th	
Total, age 6 and older	*	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD	2465
Age group								
6-11 years	*	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD	340
12-19 years	*	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD	719
20 years and older	*	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD	1406
Gender								
Males	*	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD	1227
Females	*	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD	1238
Race/ethnicity								
Mexican Americans	*	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD	884
Non-Hispanic blacks	*	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD	568
Non-Hispanic whites	*	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD	822

< LOD means less than the limit of detection (see previous table for LOD).

* Not calculated. Proportion of results below the limit of detection was too high to provide a valid result.